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Serial No.:	Unknown 07/883,619	
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For:	DOWNHOLE TOOL APPARATUS WITH NON-METALLIC COMPONENTS AND METHODS OF DRILLING THEREOF	

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INFORMATION DISCLOSURE STATEMENT

TO THE HONORABLE COMMISSIONER OF PATENTS AND TRADEMARKS

SIR:

Applicants and Applicants' attorneys are aware of the following prior art, copies of which are filed herewith along with Form PTO-1449:

1. U. S. Patent No. 4,708,202 to Sukup et al. discloses a drillable well tool. The tool is disclosed as a packer wherein a number of the components may be formed from high strength synthetic resins, the most preferred of which is glass filled nylon. Components which may be molded from this material include bottom assembly 34, ring backup 110, cones 96 and 180, ring backup 224 and lock hub 300. It is indicated that when these components are

formed from synthetic resin materials, drilling time required for removal of the tool from the well bore is reduced. FIG. 14 shows the apparatus in the form of a bridge plug.

2. U. S. Patent No. 4,858,687 to Watson et al., assigned to the assignee of the present invention, discloses a non-rotating plug set having parts made of easily drillable material, including plastic. Teeth 30 on anti-rotation insert 28 may be formed by machining or molding. See column 2, lines 2-13. Use of polycrystalline diamond compact (PDC) drill bits for drilling out plug sets and residual cement is disclosed in column 1, lines 15-28.

3. Drillable packers and bridge plugs are well known in the art for use in applications where it is simpler and less expensive to mill or drill these devices out of the well bore rather than to implement a complex retrieving operation. For drillability, packers of this type are preferably made out of materials which can be accommodated by the drill bit. Typically, soft and medium hardness cast iron are used on the pressure bearing components, along with some brass and aluminum items. Of course, the packer elements themselves are generally elastomeric. Packers of this type include the Halliburton EZ Drill® and EZ Drill SV® squeeze packers. These packers are disclosed in Halliburton Sales & Service Catalog No. 43, pages 2561-2562, published in 1985. The EZ Drill SV® squeeze packer, for example, includes a lock ring housing, upper slip wedge, lower slip wedge, and lower slip support made of soft cast iron. These components are disposed on a mandrel

made of medium hardness cast iron. The EZ Drill® squeeze packer is similarly constructed. The packer shown in FIG. 2 of the present application is substantially identical in general configuration to the EZ Drill SV® squeeze packer.

In drilling, a drill bit is used to cut and grind up the components of the packer or bridge plug to remove it from the well bore. This is a much faster operation than milling, but requires the packer or bridge plug to be made of materials which can accommodate the drill bit. In milling, a milling cutter is used to grind the packer or plug, or at least the outer components thereof, out of the well bore. Milling is a relatively slower process, but it can be used on packers having relatively harder components such as erosion-resistant hard steel.

4. U. S. Patent No. 4,834,184 to Streich et al., assigned to the assignee of the present invention, discloses a drillable squeeze packer with components fabricated from cast iron, aluminum and elastomeric material, such as discussed in paragraph 3 above.

5. U. S. Patent No. 4,151,875 to Sullaway, assigned to the assignee of the present invention, discloses a drillable packer of the type discussed in paragraph 3 above. This packer is sold under the trademark EZ Disposal™ packer by Halliburton Services and is discussed in Halliburton Sales & Service Catalog No. 43, pages 2561-2562, published in 1985.

6. The Halliburton EZ Drill® bridge plug, disclosed in Halliburton Sales & Services Catalog No. 43, pages 2556-2557, is similar to the packers discussed in paragraphs 3 and 5 above,

except that the bridge plug does not provide for fluid flow therethrough.

7. U. S. Patent No. 2,205,119 to Hall et al. discloses drillable well liners. The patent relates to drillable aluminum liners, but it is noted that other materials may be employed, either metallic or non-metallic.

8. U. S. Patent No. 2,155,129 to Hall et al. discloses a prior art liner for testing which may use frangible or friable materials such as cast metal, cementitious material, ceramic material, glass, Bakelite or any other impervious material that is readily fractured or broken. It is specifically indicated that the use of these materials is satisfactory for testing, but their use is undesirable in production liners. This prior test apparatus is disclosed in U. S. Patent No. 2,043,225 to Armentrout et al.

9. The drillable packing devices mentioned in paragraphs 3-5 above are designed for fast removal from the well bore by either rotary or cable drilling methods. Most of the components in these drillable packing devices are locked together to prevent their spinning while being drilled, and the harder slips are grooved so that they will be broken up in small pieces. Typically, standard "tri-cone" rotary drill bits are used which are rotated at speeds of about 75 to about 120 rpm. About 5,000 to about 7,000 pounds of weight is supplied to the bit for initial drilling and increased as necessary to drill out the remainder of the packer or bridge plug, depending upon its size. Typically, the drilling operation requires variation in rotary speed and bit weight to help break up

the metal parts and reestablish bit penetration should bit penetration cease while drilling. In the event of bit tracking, it is necessary to pick up the bit above the drilling surface and rapidly recontact the bit with the packing apparatus and apply weight while continuing rotation. This aids in breaking up the established bit pattern and helps to reestablish bit penetration.

10. In addition to the drillable plug set in paragraph 2 above, other apparatus use plastic components. For example, float shoes and float collars frequently incorporate plastic valve components therein. In these apparatus, the plastic components are supported in cement. Such devices are disclosed in Halliburton Sales & Services Catalog No. 43, pages 2427-2434. A typical example is disclosed in U. S. Patent No. 4,067,358 to Streich, assigned to the assignee of the present invention. See column 7, lines 52-59.

11. Drilling of well bore devices without significant metal components, such as the drillable plug sets in paragraph 2 above and the float shoes and collars described in paragraph 10 above, have been drilled using drill bits other than rotary tri-cone drill bits, such as PDC bits, as mentioned in paragraph 2 above. Such techniques are described in Halliburton Services Sales Technical Paper S-8107 entitled "SUCCESSFUL DRILL OUT OF SHOE JOINTS WITH PDC BITS", published in March, 1989.

12. A general discussion of drill bits is presented in Chapter 4 of *Fundamentals of Drilling* by John L. Kennedy, PennWell Books, Copyright 1983. PDC bits are discussed on page 73 and shown

in FIG. 4-4.

13. A publication entitled "Molding Compounds Materials Selection Handbook" published by Fiberite Corporation, 501 West Third, Winona, Minnesota 55987, Copyright 1986, discloses many engineered plastics, including the specific reinforced glass phenolic FM4056J and FM4005 discussed in the present application. This publication provides details of the material and others, along with the physical properties thereof.

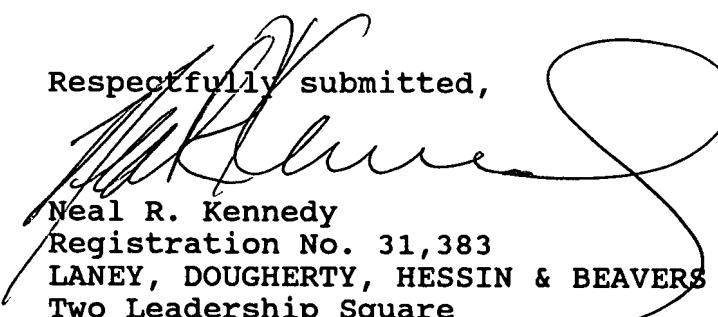
14. U. S. Patent No. 3,910,348 to Pitts discloses a drillable bridge plug.

15. A drillable packer is disclosed in U. S. Patent No. 2,589,506 to Morrisett, assigned to the assignee of the present invention. In column 5, lines 38-43, it is suggested that some of the components including wedge members, mandrel, trigger housing and coupling may be made of soft drillable materials such as magnesium alloy, and the slips may be made of a more rugged drillable material such as cast iron.

16. U. S. Patent No. 4,784,226 to Wyatt discloses a drillable cast iron bridge plug and an elastomeric packer element.

17. U. S. Patent No. 3,529,667 to Malone discloses an inflatable element which can be deformed to seat in a well bore and is drillable.

Respectfully submitted,


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